

$$e^{-\frac{1}{2}\left(\frac{v_{sp0} k_p}{\alpha_{sp0}}\right)^2} e^{-j\frac{\sqrt{N_{sp0}}}{\alpha_{sp0}}(v_{sp0} k_p)} e^{-\frac{1}{2}\left(\frac{v_{sz0} k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0} k_z)}$$
 that established the correct order to form

the ordered "string" given in SUB-APPENDIX IV--Ordering of Associations: Matrix Method. The index over s is independent of m since each "FC" of a given "SFCs" is filtered by the same Gaussian filter. In embodiments, the index for the Gaussian filter is not independent of m . In one case, some "FCs" may be filtered by the same Gaussian filters; whereas, other "FCs" may be filtered by different Gaussian filters. In another case, each "FC" may be filtered by a different Gaussian filter.

For the case where $v_{s,m} t_{0s,m} = \rho_{0s,m}$ and $k_p = k_z$, the "string" in Fourier space is one dimensional in terms of k_p and is given by

$$V_{\sum_{s,m}}(k_p, k_z) = \sum_{s=1}^S \sum_{m=1}^{M_s} \sum_{n=-\infty}^{\infty} a_{0s,m} N_{s,m\rho_0} e^{-\frac{1}{2}\left(\frac{v_{sp0} k_p}{\alpha_{sp0}}\right)^2} e^{-j\frac{\sqrt{N_{sp0}}}{\alpha_{sp0}}(v_{sp0} k_p)} e^{-jk_p \rho_{fs,m}} \sin\left(\left(k_p - n \frac{2\pi}{\rho_{0s,m}}\right) \frac{N_{s,m\rho_0}}{2}\right) \quad (37.115)$$

The "string" comprises a Fourier series, a linear sum of "FCs" each multiplied by its corresponding Gaussian filter modulation factor and modulation factor which encodes input context (Eqs. (37.114-37.115)). FIGURE 19 is a flow diagram of an exemplary hierarchical relationship of the signals in Fourier space comprising "FCs", "SFCs", "groups of SFCs", and a "string" in accordance with the present invention. Each "FC" is encoded by a "P element" or stored into and/or recalled from a "M element" as shown in FIGURE 18.- -

IN THE CLAIMS

Please replace claims 51, 83, 94, 95, 118, 137, 138, 142, 157, 193, 204, 205, 242, 244-247, 248, 252 and 267 with the following claims 51, 83, 94, 95, 118, 137, 138, 142, 157, 193, 204, 205, 242, 244-247, 248, 252 and 267:

51. (Amended) A method for recognizing a pattern in information comprising data, the method comprising:
- inputting data;
 - encoding data as parameters of a plurality of Fourier components in Fourier space;

adding at least two of said Fourier components together to form at least one Fourier series in Fourier space;

sampling at least one of said Fourier series in Fourier space with a filter to form a sampled Fourier series;

modulating said sampled Fourier series in Fourier space with said filter to form a modulated Fourier series;

determining a spectral similarity between said modulated Fourier series and another Fourier series;

determining a probability expectation value based on said spectral similarity;

generating a probability operand based on said probability expectation value;

selecting a desired value for said probability operand, wherein recognition of a pattern in said information is obtained when said probability operand having said desired value; and

outputting a recognized pattern.

83. (Amended) A method according to claim 79, wherein each Fourier series of the string is multiplied by the Fourier transform of the delayed Gaussian filter represented

by $e^{-\frac{1}{2}\left(\frac{v_{sp0}}{\alpha_{sp0}}\frac{k_p}{\alpha_{sp0}}\right)^2} e^{-j\frac{\sqrt{N_{sp0}}}{\alpha_{sp0}}(v_{sp0}k_p)} e^{-\frac{1}{2}\left(\frac{v_{sz0}}{\alpha_{sz0}}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)}$ wherein the filter established the association to form the string, wherein the string is represented by:

$$\sum_{s=1}^S \sum_{m=1}^{M_s} \sum_{n=-\infty}^{\infty} \frac{4\pi}{k_z^2 + \frac{z^2}{k_p^2}} a_{0,s,m} N_{s,m\rho_0} N_{s,mz_0} e^{-\frac{1}{2}\left(\frac{v_{sp0}}{\alpha_{sp0}}\frac{k_p}{\alpha_{sp0}}\right)^2} e^{-j\frac{\sqrt{N_{sp0}}}{\alpha_{sp0}}(v_{sp0}k_p)} e^{-\frac{1}{2}\left(\frac{v_{sz0}}{\alpha_{sz0}}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)}$$

$$e^{-jk_p(\rho_{\beta s,m} + \rho_{\gamma s,m})} \sin\left(\left(k_p - n\frac{2\pi}{\rho_{0,s,m}}\right)\frac{N_{s,m\rho_0}}{2}\right) \sin\left(\left(k_z - n\frac{2\pi}{v_{s,m}t_{0,s,m}}\right)\frac{N_{s,mz_0}}{2}\right)$$

wherein v_{sp0} and v_{sz0} are constants such as the signal propagation velocities in the ρ

and z directions, respectively, $\frac{\sqrt{N_{sp0}}}{\alpha_{sp0}}$ and $\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}$ are delay parameters and α_{sp0} and α_{sz0}

are half-width parameters of a corresponding Gaussian filter in the ρ and z directions, respectively, $\rho_{t_{s,m}} = v_{t_{s,m}} t_{t_{s,m}}$ is the modulation factor which corresponds to the physical

time delay $t_{s,m}$, $\rho_{fb_{s,m}} = v_{fb_{s,m}} t_{fb_{s,m}}$ is the modulation factor which corresponds to the specific transducer time delay $t_{fb_{s,m}}$, $v_{t_{s,m}}$ and $v_{fb_{s,m}}$ are constants such as the signal propagation velocities, $\alpha_{0_{s,m}}$ is a constant, k_p and k_z are the frequency variables, n , m , s , M_s , and S are integers, and $N_{s,m\rho_0}$, N_{s,mz_0} , $\rho_{0_{s,m}}$, and $z_{0_{s,m}}$ are data parameters.

94. (Amended) A method according to claim 91, wherein the filter is characterized in time by:

$$\frac{\alpha}{\sqrt{2\pi}} e^{-\frac{\left(t - \frac{\sqrt{N}}{\alpha}\right)^2}{\frac{2}{\alpha^2}}}$$

wherein $\frac{\sqrt{N}}{\alpha}$ is a delay parameter, α is a half-width parameter, and t is the time parameter.

95. (Amended) A method according to claim 94, wherein the filter, in frequency space, is characterized by:

$$e^{-\frac{1}{2}\left(\frac{2\pi f}{\alpha}\right)^2} e^{-j\sqrt{N}\left(\frac{2\pi f}{\alpha}\right)}$$

wherein $\frac{\sqrt{N}}{\alpha}$ and α are a corresponding delay parameter and a half-width parameter in time, respectively, and f is the frequency parameter.

118. (Amended) A method for recognizing a pattern in information, the method comprising:

- inputting information;
- representing the information as a plurality of Fourier series in Fourier space;
- forming associations between at least two of the Fourier series by modulating and sampling the Fourier series with filters and by coupling the filtered Fourier series based on a probability distribution, wherein when at least two of the Fourier series have been associated recognition of a pattern in the information is achieved; and
- outputting a recognized pattern in the information.

B17

137. (Amended) A method according to claim 127, wherein each filter of the set of filters is a time delayed Gaussian filter having a delay parameter $\frac{\sqrt{N}}{\alpha}$ which corresponds to a time point.

138. (Amended) A method according to claim 137, wherein each Fourier series of the string is multiplied by the Fourier transform of the delayed Gaussian filter represented by $e^{-\frac{1}{2}\left(\frac{v_{sp0}}{\alpha_{sp0}}\frac{k_p}{\alpha_{sp0}}\right)^2} e^{-j\frac{\sqrt{N_{sp0}}}{\alpha_{sp0}}(v_{sp0}k_p)} e^{-\frac{1}{2}\left(\frac{v_{sz0}}{\alpha_{sz0}}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)}$ wherein the filter established the correct order to form the string, wherein the ordered string is represented by:

$$\sum_{s=1}^S \sum_{m=1}^{M_s} \sum_{n=-\infty}^{\infty} \frac{4\pi}{1 + \frac{k_z^2}{k_p^2}} a_{0s,m} N_{s,m\rho_0} N_{s,mz_0} e^{-\frac{1}{2}\left(\frac{v_{sp0}}{\alpha_{sp0}}\frac{k_p}{\alpha_{sp0}}\right)^2} e^{-j\frac{\sqrt{N_{sp0}}}{\alpha_{sp0}}(v_{sp0}k_p)} e^{-\frac{1}{2}\left(\frac{v_{sz0}}{\alpha_{sz0}}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)}$$

$$e^{-jk_p(\rho_{fb_{s,m}} + \rho_{ts,m})} \sin\left(\left(k_p - n\frac{2\pi}{\rho_{0s,m}}\right)\frac{N_{s,m\rho_0}}{2}\right) \sin\left(\left(k_z - n\frac{2\pi}{v_{s,m}t_{0s,m}}\right)\frac{N_{s,mz_0}}{2}\right)$$

wherein v_{sp0} and v_{sz0} are constants such as the signal propagation velocities in the ρ and z directions, respectively, $\frac{\sqrt{N_{sp0}}}{\alpha_{sp0}}$ and $\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}$ are delay parameters and α_{sp0} and α_{sz0} are half-width parameters of a corresponding Gaussian filter in the ρ and z directions, respectively, $\rho_{ts,m} = v_{ts,m}t_{ts,m}$ is the modulation factor which corresponds to the physical time delay $t_{ts,m}$, $\rho_{fb_{s,m}} = v_{fb_{s,m}}t_{fb_{s,m}}$ is the modulation factor which corresponds to the specific transducer time delay $t_{fb_{s,m}}$, $v_{ts,m}$ and $v_{fb_{s,m}}$ are constants such as the signal propagation velocities, $a_{0s,m}$ is a constant, k_p and k_z are the frequency variables, n , m , s , M_s , and S are integers, and $N_{s,m\rho_0}$, N_{s,mz_0} , $\rho_{0s,m}$, and $z_{0s,m}$ are data parameters.

B18

142. (Amended) A method according to claim 138, wherein $v_{s,m}t_{0s,m} = \rho_{0s,m}$ and $k_p = k_z$ such that the string in Fourier space is one dimensional in terms of k_p and is represented by

$$\sum_{s=1}^S \sum_{m=1}^{M_s} \sum_{n=-\infty}^{\infty} a_{0s,m} N_{s,m\rho_0} e^{-\frac{1}{2}\left(\frac{v_{sp0}}{\alpha_{sp0}}\frac{k_p}{\alpha_{sp0}}\right)^2} e^{-j\frac{\sqrt{N_{sp0}}}{\alpha_{sp0}}(v_{sp0}k_p)} e^{-jk_p\rho_{fb_{s,m}}} \sin\left(\left(k_p - n\frac{2\pi}{\rho_{0s,m}}\right)\frac{N_{s,m\rho_0}}{2}\right)$$

wherein v_{sp0} is a constant such as the signal propagation velocity in the ρ direction,

$\frac{\sqrt{N_{sp0}}}{\alpha_{sp0}}$ is a delay parameter and α_{sp0} is a half-width parameter of a corresponding Gaussian filter in the k_ρ -space, $\rho_{fb_{s,m}} = v_{fb_{s,m}} t_{fb_{s,m}}$ is the modulation factor which corresponds to the specific transducer time delay $t_{fb_{s,m}}$, $v_{fb_{s,m}}$ is a constant such as the signal propagation velocity, $a_{0_{s,m}}$ is a constant, k_ρ is the frequency variable, n, m, s, M_s , and S are integers, and $N_{s,m_{p0}}$ and $\rho_{0_{s,m}}$ are data parameters.

193. (Amended) A computer-readable medium according to claim 189, wherein each Fourier series of the string is multiplied by the Fourier transform of the delayed

Gaussian filter represented by $e^{-\frac{1}{2}\left(v_{sp0}\frac{k_\rho}{\alpha_{sp0}}\right)^2} e^{-j\frac{\sqrt{N_{sp0}}}{\alpha_{sp0}}(v_{sp0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)}$ wherein the filter established the association to form the string, wherein the string is represented by:

$$\sum_{s=1}^S \sum_{m=1}^{M_s} \sum_{n=-\infty}^{\infty} \frac{4\pi}{1 + \frac{k_z^2}{k_\rho^2}} a_{0_{s,m}} N_{s,m_{p0}} N_{s,m_{z0}} e^{-\frac{1}{2}\left(v_{sp0}\frac{k_\rho}{\alpha_{sp0}}\right)^2} e^{-j\frac{\sqrt{N_{sp0}}}{\alpha_{sp0}}(v_{sp0}k_\rho)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)}$$

$$e^{-jk_\rho(\rho_{fb_{s,m}} + \rho_{0_{s,m}})} \sin\left(\left(k_\rho - n\frac{2\pi}{\rho_{0_{s,m}}}\right)\frac{N_{s,m_{p0}}\rho_{0_{s,m}}}{2}\right) \sin\left(\left(k_z - n\frac{2\pi}{v_{s,m}t_{0_{s,m}}}\right)\frac{N_{s,m_{z0}}z_{0_{s,m}}}{2}\right)$$

wherein v_{sp0} and v_{sz0} are constants such as the signal propagation velocities in the ρ and z directions, respectively, $\frac{\sqrt{N_{sp0}}}{\alpha_{sp0}}$ and $\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}$ are delay parameters and α_{sp0} and α_{sz0} are half-width parameters of a corresponding Gaussian filter in the ρ and z directions, respectively, $\rho_{t_{s,m}} = v_{t_{s,m}} t_{t_{s,m}}$ is the modulation factor which corresponds to the physical time delay $t_{t_{s,m}}$, $\rho_{fb_{s,m}} = v_{fb_{s,m}} t_{fb_{s,m}}$ is the modulation factor which corresponds to the specific transducer time delay $t_{fb_{s,m}}$, $v_{t_{s,m}}$ and $v_{fb_{s,m}}$ are constants such as the signal propagation velocities, $a_{0_{s,m}}$ is a constant, k_ρ and k_z are the frequency variables, n, m, s, M_s , and S are integers, and $N_{s,m_{p0}}$, $N_{s,m_{z0}}$, $\rho_{0_{s,m}}$, and $z_{0_{s,m}}$ are data parameters

204. (Amended) A computer-readable medium according to claim 201, wherein the filter is characterized in time by:

B20

$$\frac{\alpha}{\sqrt{2}\pi} e^{\frac{\left(t - \frac{\sqrt{N}}{\alpha}\right)^2}{\frac{2}{\alpha^2}}}$$

wherein $\frac{\sqrt{N}}{\alpha}$ is a delay parameter, α is a half-width parameter, and t is the time parameter.

205. (Amended) A computer-readable medium according to claim 201, wherein the filter, in frequency space, is characterized by:

$$e^{-\frac{1}{2}\left(\frac{2\pi f}{\alpha}\right)^2} e^{-j\sqrt{N}\left(\frac{2\pi f}{\alpha}\right)}$$

wherein $\frac{\sqrt{N}}{\alpha}$ and α are a corresponding delay parameter and a half-width parameter in time, respectively, and f is the frequency parameter.

B21

242. (Amended) A computer-readable medium according to claim 237, wherein said probability operands having a value selected from a set of zero and one.

B22

244. (Amended) A computer-readable medium to claim 237, wherein the high level memory is initialized with standard inputs.

245. (Amended) A computer-readable medium to claim 237, wherein the ordering is according to one of the list of: temporal order, cause and effect relationships, size order, intensity order, before-after order, top-bottom order, or left-right order.

246. (Amended) A computer-readable medium to claim 237, wherein each filter of the set of filters is a time delayed Gaussian filter having a half-width parameter α which determines the amount of the string that is sampled.

247. (Amended) A computer-readable medium to claim 237, wherein each filter of the set of filters is a time delayed Gaussian filter having a delay parameter $\frac{\sqrt{N}}{\alpha}$ which corresponds to a time point.

248. (Amended) A computer-readable medium to claim 247, wherein each Fourier series of the string is multiplied by the Fourier transform of the delayed Gaussian filter

represented by $e^{-\frac{1}{2}\left(v_{sp0}\frac{k_p}{\alpha_{sp0}}\right)^2} e^{-j\frac{\sqrt{N_{sp0}}}{\alpha_{sp0}}(v_{sp0}k_p)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)}$ wherein the filter established the correct order to form the string, wherein the ordered string is represented by:

$$\sum_{s=1}^S \sum_{m=1}^{M_s} \sum_{n=-\infty}^{\infty} \frac{4\pi}{k_z^2 + \frac{k_z^2}{k_p^2}} a_{0,s,m} N_{s,m\rho_0} N_{s,mz_0} e^{-\frac{1}{2}\left(v_{sp0}\frac{k_p}{\alpha_{sp0}}\right)^2} e^{-j\frac{\sqrt{N_{sp0}}}{\alpha_{sp0}}(v_{sp0}k_p)} e^{-\frac{1}{2}\left(v_{sz0}\frac{k_z}{\alpha_{sz0}}\right)^2} e^{-j\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}(v_{sz0}k_z)}$$

$$e^{-jk_p(\rho_{fb_{s,m}} + \rho_{ts,m})} \sin\left(\left(k_p - n\frac{2\pi}{\rho_{0,s,m}}\right) \frac{N_{s,m\rho_0} \rho_{0,s,m}}{2}\right) \sin\left(\left(k_z - n\frac{2\pi}{v_{s,m}t_{0,s,m}}\right) \frac{N_{s,mz_0} z_{0,s,m}}{2}\right)$$

wherein v_{sp0} and v_{sz0} are constants such as the signal propagation velocities in the ρ and z directions, respectively, $\frac{\sqrt{N_{sp0}}}{\alpha_{sp0}}$ and $\frac{\sqrt{N_{sz0}}}{\alpha_{sz0}}$ are delay parameters and α_{sp0} and α_{sz0} are half-width parameters of a corresponding Gaussian filter in the ρ and z directions, respectively, $\rho_{ts,m} = v_{ts,m} t_{ts,m}$ is the modulation factor which corresponds to the physical time delay $t_{ts,m}$, $\rho_{fb_{s,m}} = v_{fb_{s,m}} t_{fb_{s,m}}$ is the modulation factor which corresponds to the specific transducer time delay $t_{fb_{s,m}}$, $v_{ts,m}$ and $v_{fb_{s,m}}$ are constants such as the signal propagation velocities, $a_{0,s,m}$ is a constant, k_p and k_z are the frequency variables, n , m , s , M_s , and S are integers, and $N_{s,m\rho_0}$, N_{s,mz_0} , $\rho_{0,s,m}$, and $z_{0,s,m}$ are data parameters.

252. (Amended) A computer-readable medium to claim 248, wherein $v_{s,m}t_{0,s,m} = \rho_{0,s,m}$ and $k_p = k_z$ such that the string in Fourier space is one dimensional in terms of k_p and is represented by

$$\sum_{s=1}^S \sum_{m=1}^{M_s} \sum_{n=-\infty}^{\infty} a_{0,s,m} N_{s,m\rho_0} e^{-\frac{1}{2}\left(v_{sp0}\frac{k_p}{\alpha_{sp0}}\right)^2} e^{-j\frac{\sqrt{N_{sp0}}}{\alpha_{sp0}}(v_{sp0}k_p)} e^{-jk_p\rho_{fb_{s,m}}} \sin\left(\left(k_p - n\frac{2\pi}{\rho_{0,s,m}}\right) \frac{N_{s,m\rho_0} \rho_{0,s,m}}{2}\right)$$

wherein v_{sp0} is a constant such as the signal propagation velocity in the ρ direction, $\frac{\sqrt{N_{sp0}}}{\alpha_{sp0}}$ is a delay parameter and α_{sp0} is a half-width parameter of a corresponding Gaussian filter in the k_p -space, $\rho_{fb_{s,m}} = v_{fb_{s,m}} t_{fb_{s,m}}$ is the modulation factor which corresponds to the specific transducer time delay $t_{fb_{s,m}}$, $v_{fb_{s,m}}$ is a constant such as the signal propagation velocity, $a_{0,s,m}$ is a constant, k_p is the frequency variable, n , m , s , M_s , and S are integers, and $N_{s,m\rho_0}$ and $\rho_{0,s,m}$ are data parameters.